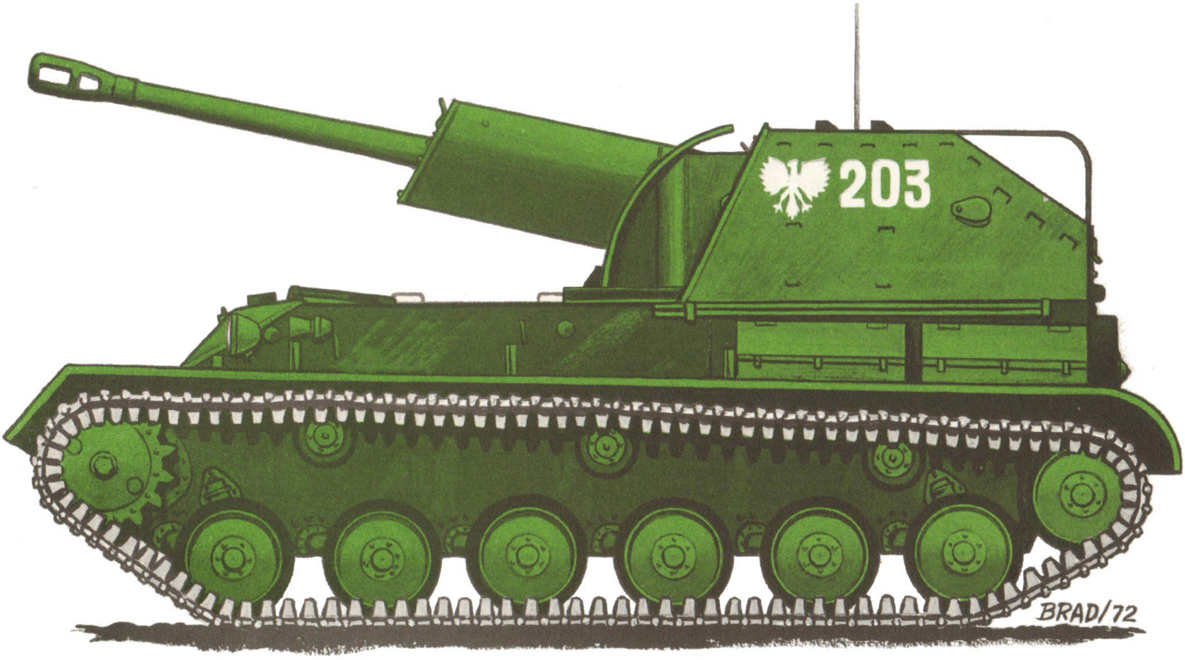
BELLONA

SERIES
35

MILITARY VEHICLE PRINTS



SERIES THIRTY FIVE

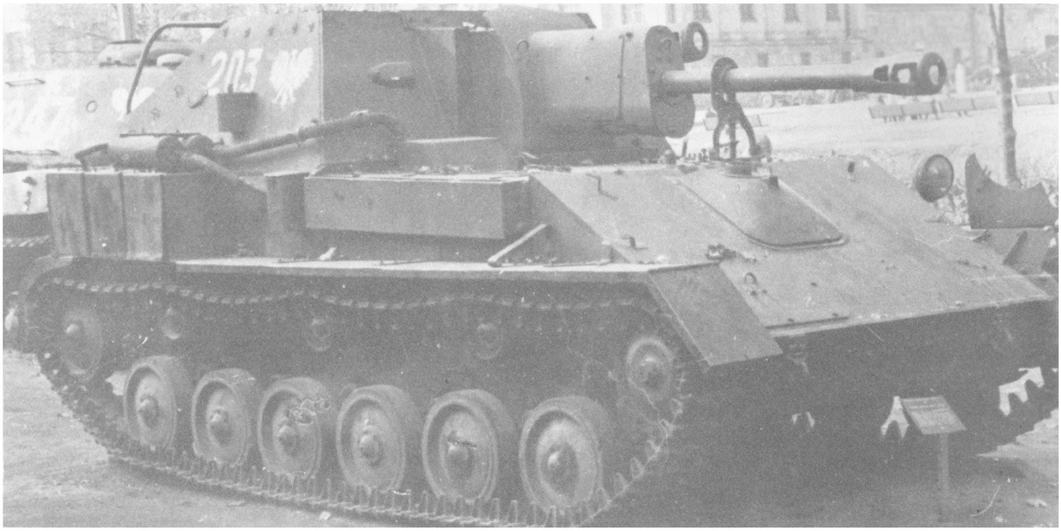
SAMOKHODNAYA USTANOVKA 76

The Soviet SU76 Selfpropelled Gun Variants

by D.P.Dyer

(SU)

DETAILED PLAN VIEWS PRESENTED IN 1:25, 1:48 & 1:76 SCALE 30p

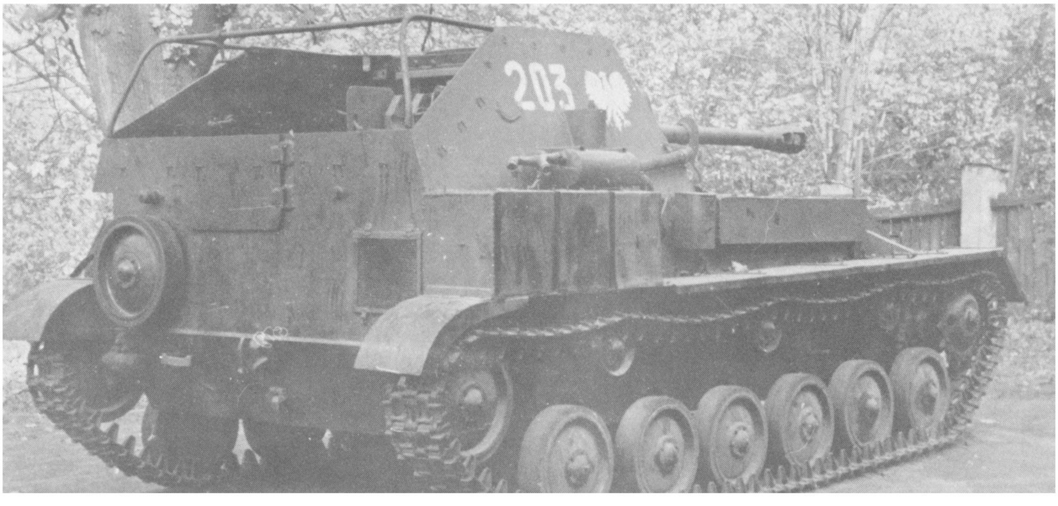


ABOVE: *A Wartime model of the SU.76 which is now on display in the Grounds of the People's Armed Forces Museum in Warsaw, Poland. This clear front view picture shows the twin exhausts on the right hand side while the gun it in it's travelling lock. Note the left hand mudguard flap is hinged back.*
(WLODZIMIERZ KRZYZANOWSKI PHOTOGRAPH)

COVER ILLUSTRATION – Drawn by George Bradford
The cover drawing illustrates the vehicle found in the People's Armed Forces Museum in Warsaw. The markings of this vehicle show, the white Polish Eagle and the vehicle serial number. This white eagle was the insignia of the Wojska Polskiego (W.P.) – Polish troops who fought alongside the Russians against the Germans from 1943. The Wojska Polskiego were equipped with SU.76 towards the end of the War. The same white eagle was the markings used on the vehicles of the AK (Polish Home Army) during the unsuccessful Warsaw rising in August 1944. In another rising, the Hungarian – in October 1956, the SU.76 was used in action against the Soviet Army. The markings on these vehicles was the Hungarian National shield crest painted on the sides of the fighting compartment.

BELLONA MILITARY VEHICLE PRINTS – Series Editor: Hilary Louis Doyle

BELOW: *This rear view of the Polish Museum exhibit shows clearly chamfered sides on the fighting compartment and the low rear plate. The tubular frame work is for the severe weather tarpaulin cover. To the left of the cross member tube is a bracket which was used to attach the anti-aircraft machine gun mounting.*
(WLODZIMIERZ KRZYZANOWSKI PHOTOGRAPH)



SAMOKHODNAYA USTANOVKA (SU.76) — 1942

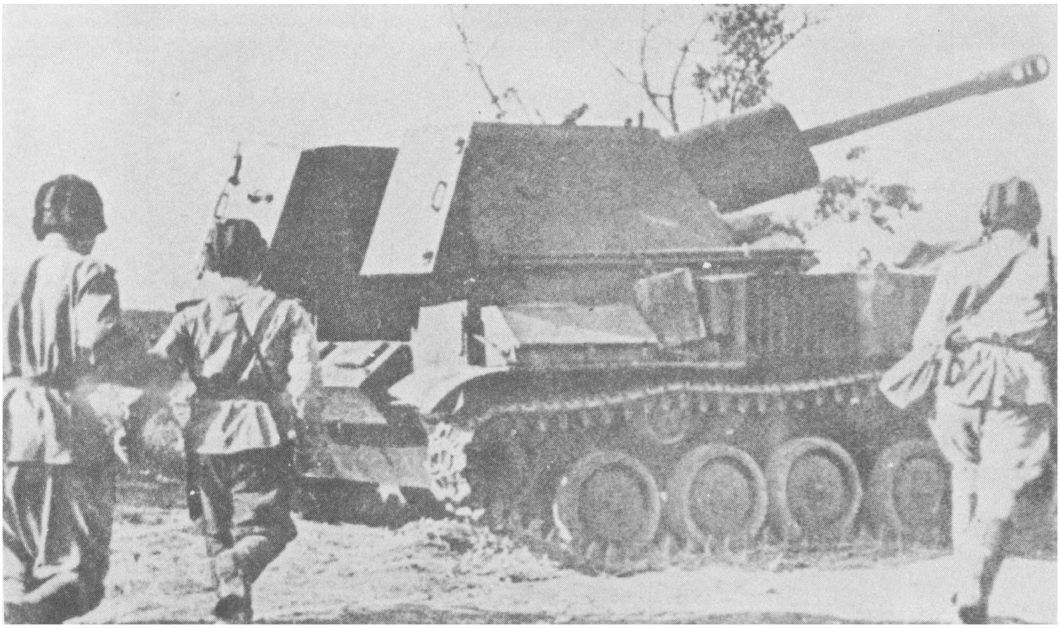
Drawings and historical research by D.P. Dyer.

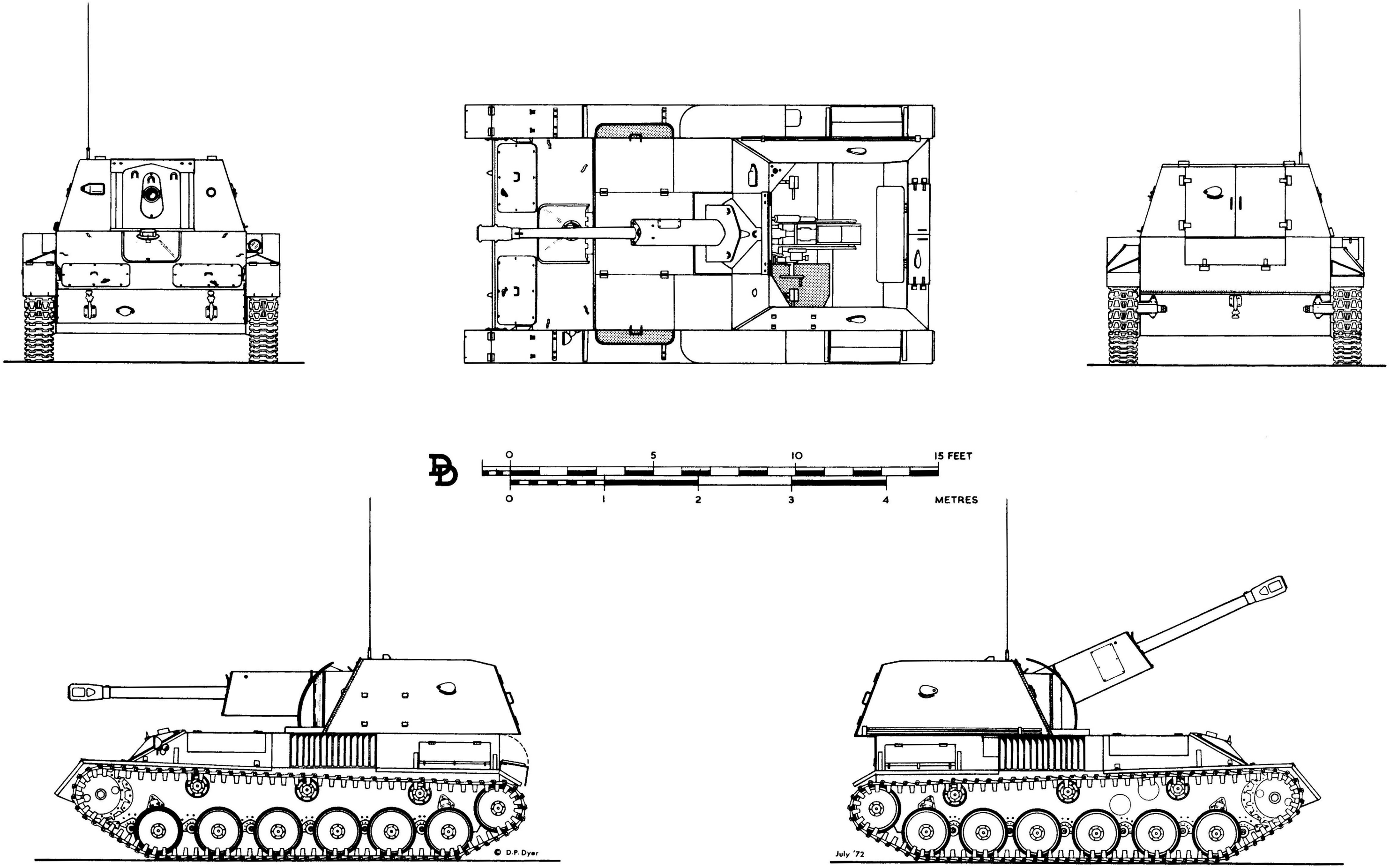
Whilst the Russian 76mm Divisional Gun had been designed, and existed in prototype form, before the Invasion in 1941 the Soviet losses sustained during the early German advances made it imperative for it into production as quickly as possible. Mass production was instituted in 1942 as the ZIS-3, being termed M.1942 by the Western armies after the year of introduction. Although not designed as an anti-tank gun, a piercing ammunition was provided which have it a very creditable anti-tank performance. At this time the maximum thickness of vertical armour on German tanks was 50mm and the penetrative power of the ordinary 76mm Armour Piercing High Explosive Shell was 70mm vertical armour at 500 metres. For comparison, the United States 75mm M3 L/40 gun fitted to vast numbers of 'Sherman' tanks was a near equivalent as regards performance.

The German advance had also shown the Russians the inadequacies of light tanks. In order to utilise the production facilities already in existence, for light tanks, and at the same time increase the tactical mobility of the new gun for use in the anti-tank role, a design was evolved amalgamating them together as a self propelled mount. For the purpose all automotive components of the T.70 Light Tanks, including engine, gearbox, final drive, road wheels, return rollers, Sprockets, suspension arms, and tracks were utilised along with various external fittings such as the driver's hatch, stowage boxes, towing hooks, and mufflers. These components were assembled in and on a simple slab sided flat bottomed chassis the front of which had a well sloped glacis plate. This chassis was both longer and wider than that of the T.70 and was fitted with one additional road wheel on each side, the fourth and fifth wheels being set closer together than the remainder to give additional support under the gun itself. It would appear that originally the two engines were fitted one either side of this chassis each having a completely separate transmission to drive one track. No doubt the drive to each track could be synchronised for straight ahead running in the manner of the British Medium Mk A 'Whippet' (Bellona Prints Series 1).

These vehicles had the gun located centrally in the rear fighting compartment which had all four faces sloped in towards the top. Access was gained by triple doors at the rear, the two upper sections opening outwards and a lower stepped section opening downwards. Both sides of this model of the SU.76 were symmetrical with an air outlet, air intake, and a stowage box along each track guard and with a servicing cover hatch each side of the glacis plate as shown in the drawing on page 4, and the photograph on page 3. A further photograph on page 6 shows another rare version of this 'symmetrical' model which has an armoured roof and commander's cupola

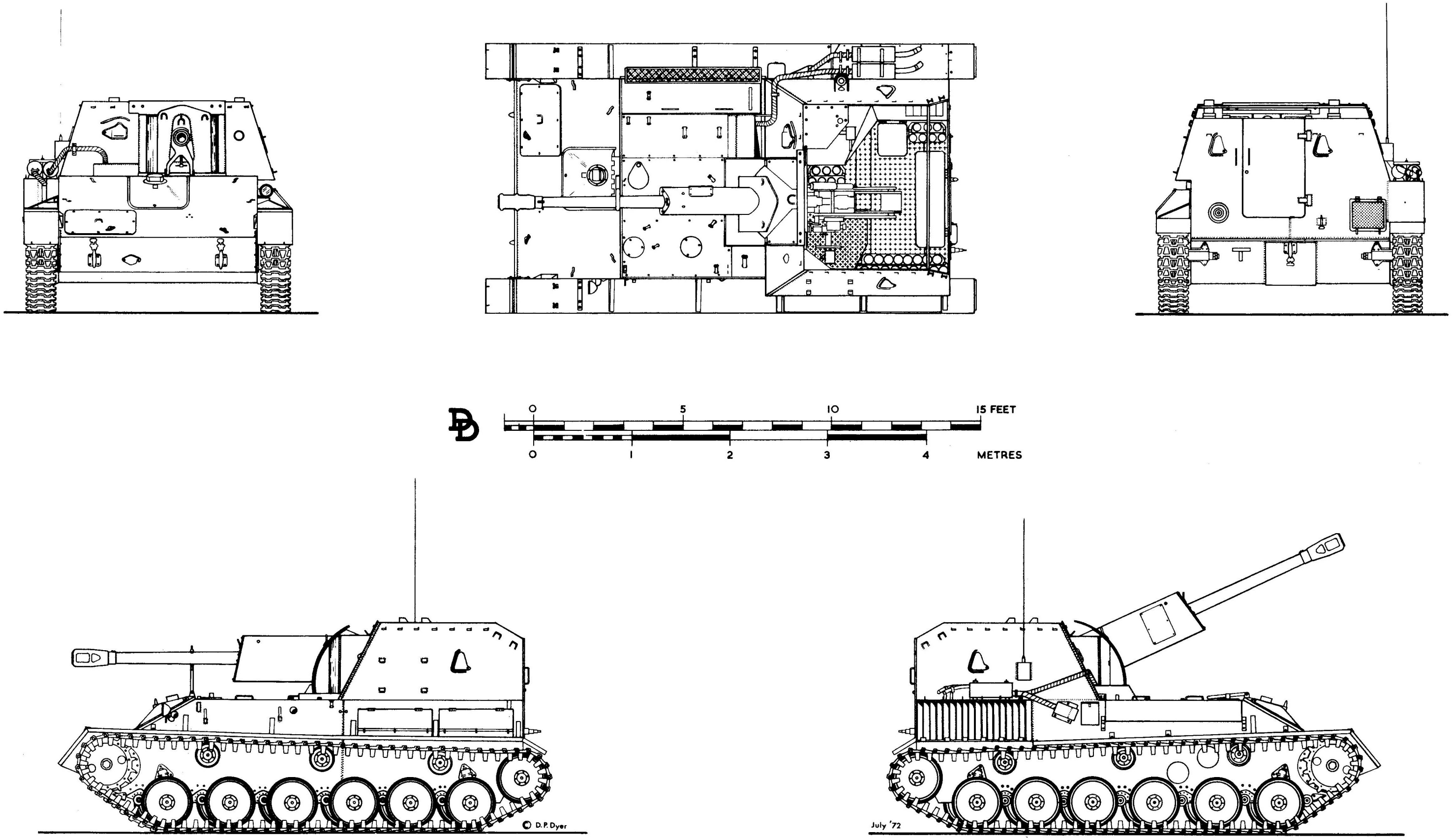
BELOW: *One of the few photographs available at the present time which show the details of the SU.76 with the centralised fighting compartment. Note the high rear armour plate and the three part set of doors.*
(R.J. ICKS PHOTOGRAPH)





SAMOKHODNAYA USTANOVKA (S.U.) 76

CENTRALISED FIGHTING COMPARTMENT - PROVISIONAL DRAWING

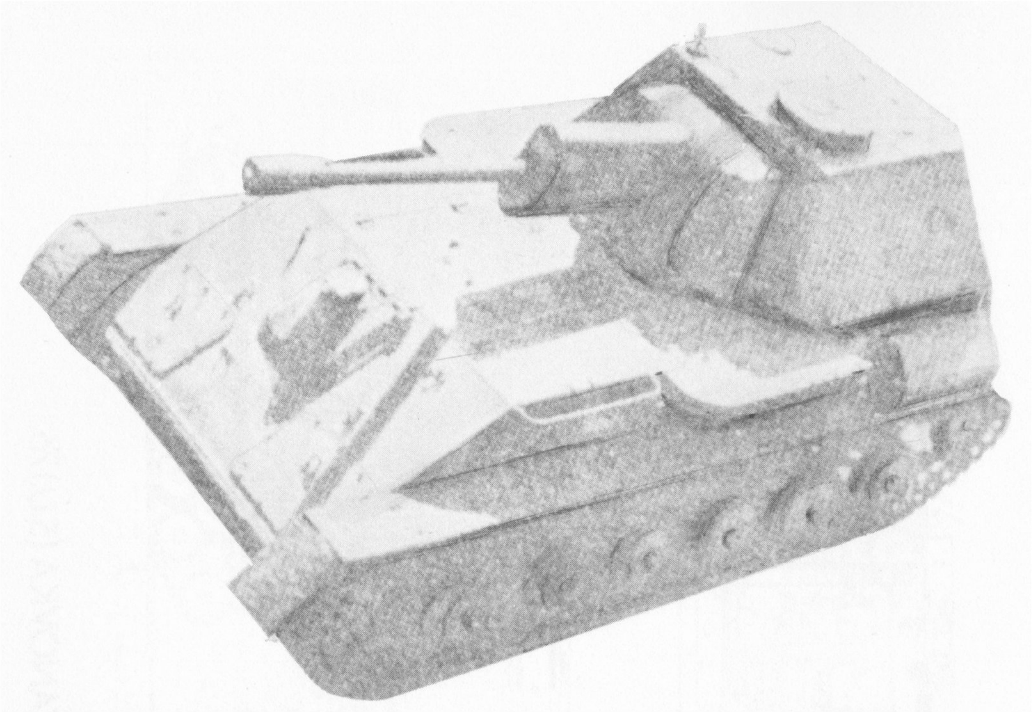


© D.P. Dyer

July '72

LATE MODEL

SAMOKHODNAYA USTANOVKA (S.U.) 76



ABOVE: *At time of writing this poor photograph is the only one available of the SU.76, centralised fighting compartment, with an armoured roof. The commander's cupola is seen to the right hand side.* **(J.F. MILSOM PHOTOGRAPH)**

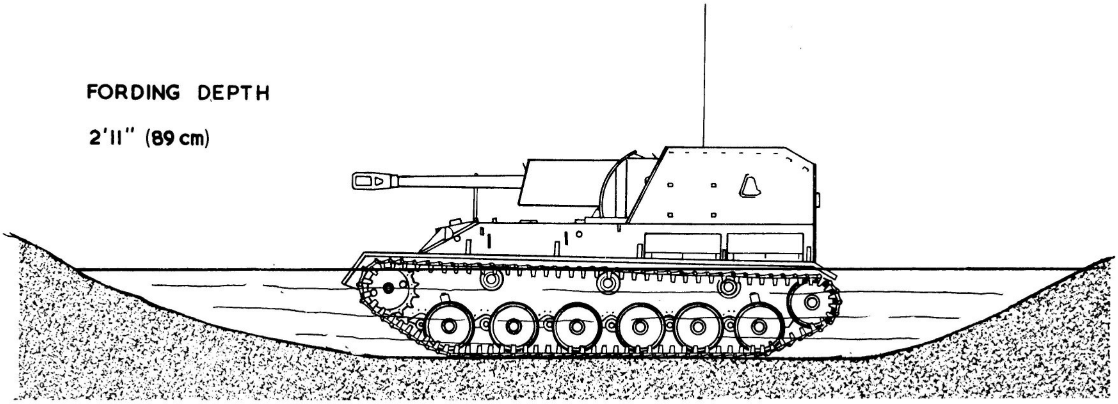
fitted over the fighting compartment. At the time of writing this poor photograph is the only one located. In view of the scarcity of photographs it is thought that the 'symmetrical' model was only produced as a pilot series, although it could be that whilst entering production they just weren't photographed to any extent, the Russians having far greater priorities at the time.

The model of the SU.76 which appears in the majority of World War II photographs is the subject of the 1:48 scale drawing on the centre pages. This version had the twin engines connected in tandem together with a clutch, differential, steering brakes, fan, and radiator, inside the hull on the right hand side. The air intake, air outlet, exhausts, and mufflers were also on the right hand side. Due to the large radiator shroud which extended into the fighting compartment the gun had to be moved off centre towards the left to enable any traverse in that direction to be obtained, which even then was restricted to 12 degrees. In order to give the gunner the barest minimum of elbow room when the gun was fully traversed 20 degrees right, the left side of the fighting compartment was extended outwards to overhang the hull. The stowage box displaced from the right hand track guard was transferred to the left. The rear of this version was simplified very considerably by being made vertical and reduced in height. The rear top corners of the sides of the fighting compartment were chamfered heavily to match the new low rear plate. A small single rear door replaced the previous three. In view of the change from a symmetrical design which allowed similar traverse of the gun either side of the centre line, it can only be assumed that there were advantages to be gained by having the engines in tandem, either from a production or driving point of view.

The final model which is the basis for the drawings on page 5 and the sectional drawings. This version widely used by the North Korean People's Army during the Korean War. This late model differed only slightly from the more common wartime version mainly with regard to the shape of the sides and rear of the fighting compartment which was again increased in height to give greater protection. Detail changes included altered shapes for the pistol ports and the commanders forward vision port.

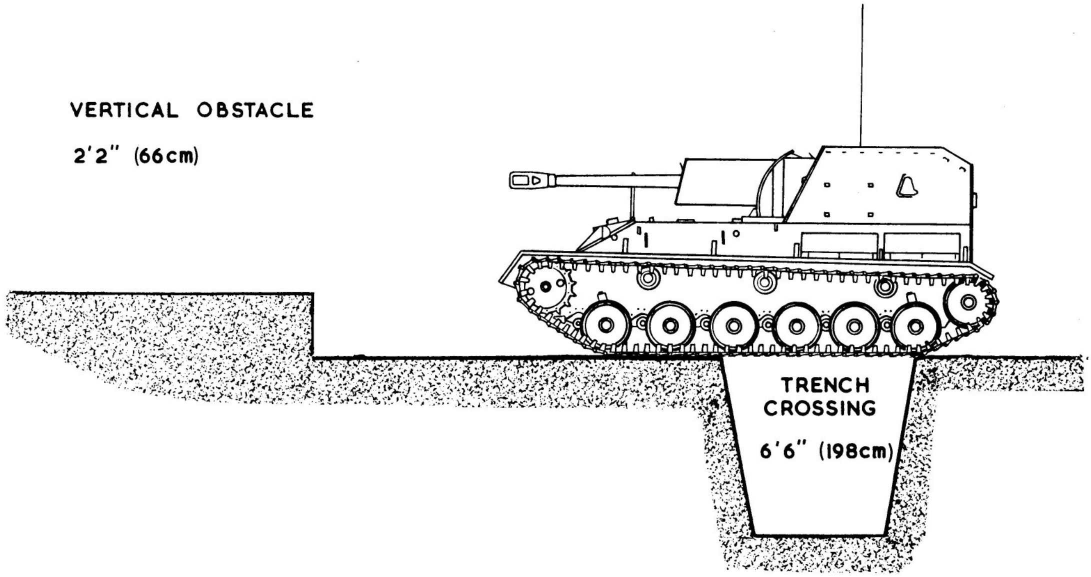
Production of the SU.76 commenced towards the end of 1942, but by the time they made their appearance in any quantity during 1943 the German PzKpfw 'Tiger' Ausf.E had been introduced to the Eastern Front, while the PzKpfw 'Panther' appeared later in that year. Against both of these tanks the 76mm gun was inadequate. In any case these lightly armoured, self-propelled, medium range, anti tank guns were more suitable when depending on concealment and ambush to be effective, which necessitated the enemy advancing onto them. With the Russian changeover to the offensive the need was for more heavily armoured mobile guns that could advance against hostile fire, and were able to destroy opposition at as great a range as possible. However, the

OBSTACLE CHART SU 76 SCALE 1:76



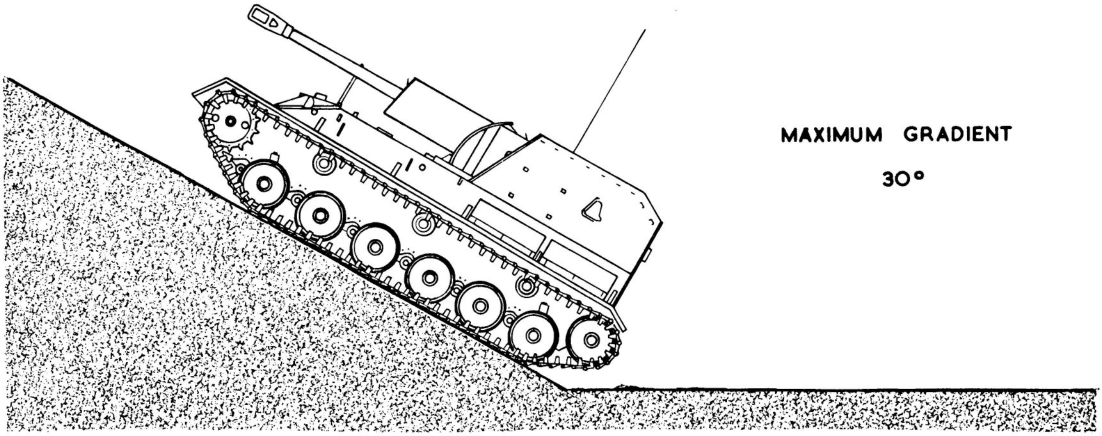
FORDING DEPTH

2'11" (89 cm)



VERTICAL OBSTACLE

2'2" (66cm)



MAXIMUM GRADIENT

30°

production of these heavier armed and armoured self propelled guns such as the SU.85 had been instituted at the same time as the SU.76 (SU.85 Bellona Prints Series 7). These were followed by even heavier armed vehicles and the SU.76 was gradually relegated more and more to a highly mobile field piece for Infantry support, in which capacity it continued in service up to the end of the War. By this time an arrow head shot (HVAP) had been introduced for the 76mm gun which increased the armour penetration to 92mm vertical at 500 metres. While the number of SU.76 chassis increased, the demand for it as an anti-tank gun mount decreased and vehicles were often used, with the gun removed and the aperture blanked over, in a variety of roles including armoured recovery, fuel and ammunition carriers, gun tractors, and rocket launchers. Fitted with a different superstructure and mounting either single or twin 37mm guns they were known as SU.37 and used for mobile anti-aircraft defence.

In the postwar years the SU.76 was supplied in small numbers to Nations of the Warsaw Pact, to China and North Korea where as mentioned previously it was used in the Korean War which started on 25th June 1950.

The design as with other Russian Armoured Fighting Vehicles made no concessions for crew comfort. Life for the driver must have been uncomfortable in the extreme, as no bulkhead was provided between him and the engines which flanked him. The noise, heat, and fumes from the engines would be combined with the fumes from the exposed steering brakes in the bow. With his driving hatch closed no fresh air was available to him other than that which had already been drawn through the radiators. Whilst this may have been of benefit during the winter months it cannot have been pleasant during hot weather. Although the fighting compartment was vulnerable to air bursts at least the gun crew were exposed to fresh air providing their waterproof cover was not rigged. Firing the gun with this in position would have been most uncomfortable as no means were provided for extracting the cordite fumes. Reference has been made to the Russian crews naming the SU.76 'Sukami' meaning 'bitch' and it is not thought that this was a term of endearment.

One of the benefits of the tandem engine mounting alongside the driver was that control linkages could be kept very short and simple. Due to there being no control rods requiring a false floor to protect them the floor of the vehicle was purely the bottom armour plate with tunnels running across at intervals enclosing the torsion bars. With the construction of the glacis plate the servicing aperture very nearly connected with the driver's hatch and would therefore have greatly weakened the frontal armout at this point. At the rear there was no armour protection over the rear cooling air inlet, and any shot fired into this would be able to pierce the radiator. The overall layout left a lot to be desired, as behind the driver, reaching back to the fighting compartment was just empty space, which had to be left clear to enable the driver to get to his seat when his hatch was closed. This hatch was operated by a handle which extended into the driving compartment to the left. This handle was interconnected to a spring equilibrator which partially counterbalanced the weight of the hatch. A spring loaded plunger located into notches on the equilibrator shaft thereby retaining the hatch in the desired position out of the three alternatives of opening. By pulling the plunger handle the hatch would close under it's own weight as it overcame the tension of the equilibrator spring. A simple cam faced clamp at the front of the hatch, operable only from the inside, was used to retain the hatch in the closed position. Forward vision was then restricted to the field of view obtainable through the rotateable periscope. This periscope was offset slightly to the right of centre of the hatch to allow for the hatch opening mechanism situated on the left.

Above the driver's head was a small opening through which he could undo the gun barrel locking clamp without exposing himself. This opening was covered by a lid working on the lift and turn principle and could be clamped tight from inside. Owing to the weight of armour of the curved elevation shield for the gun and that for the recoil mechanism, all of which was in front of the elevation trunnions, a heavy cast iron weight was bolted under the breech end of the recoil slide to act as a counterbalance. The transverse tube at the rear of the SU.76 for supporting the waterproof cover was also used to carry a bracket for mounting the Degtyarev machine gun for use in an anti-aircraft role.

It is regretted that complete stowage of items cannot be shown on the drawings owing to lack of information regarding them. The items themselves are missing on exhibits, the majority of photographs are too indistinct, or when clear invariably have groups of Russian Infantry riding on the vehicle.

As far as is known at least five SU.76 are still in existence as follows:-

Late Model — R.A.C. Tank Museum, Bovington, Dorset, England.

Late Model — Ordnance Museum, Army Proving Ground, Maryland, U.S.A.

Late Model — Central Museum of the Soviet Army, Moscow, U.S.S.R.

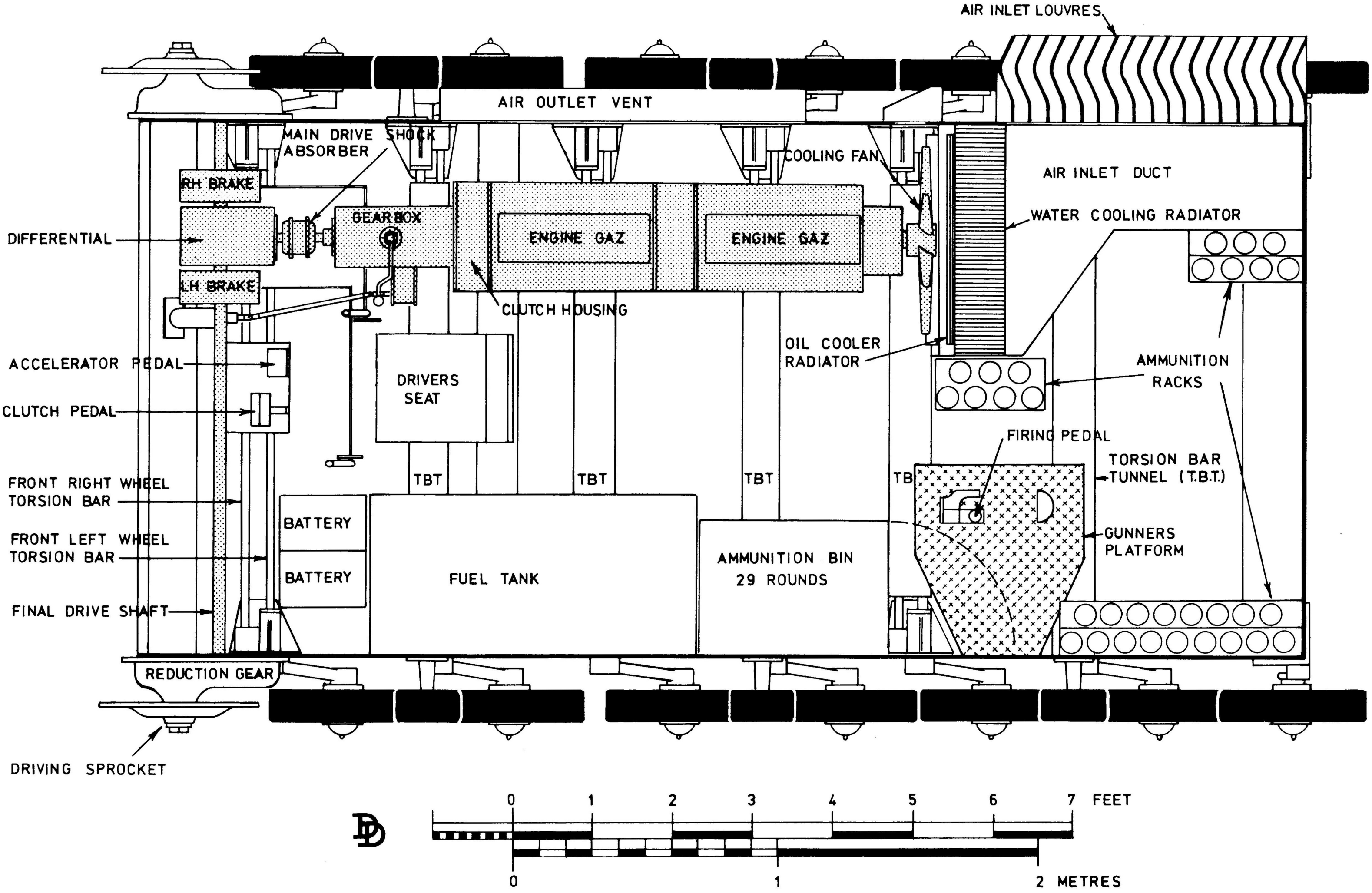
Early Model — Peoples Armed Forces Museum, Warsaw, Poland

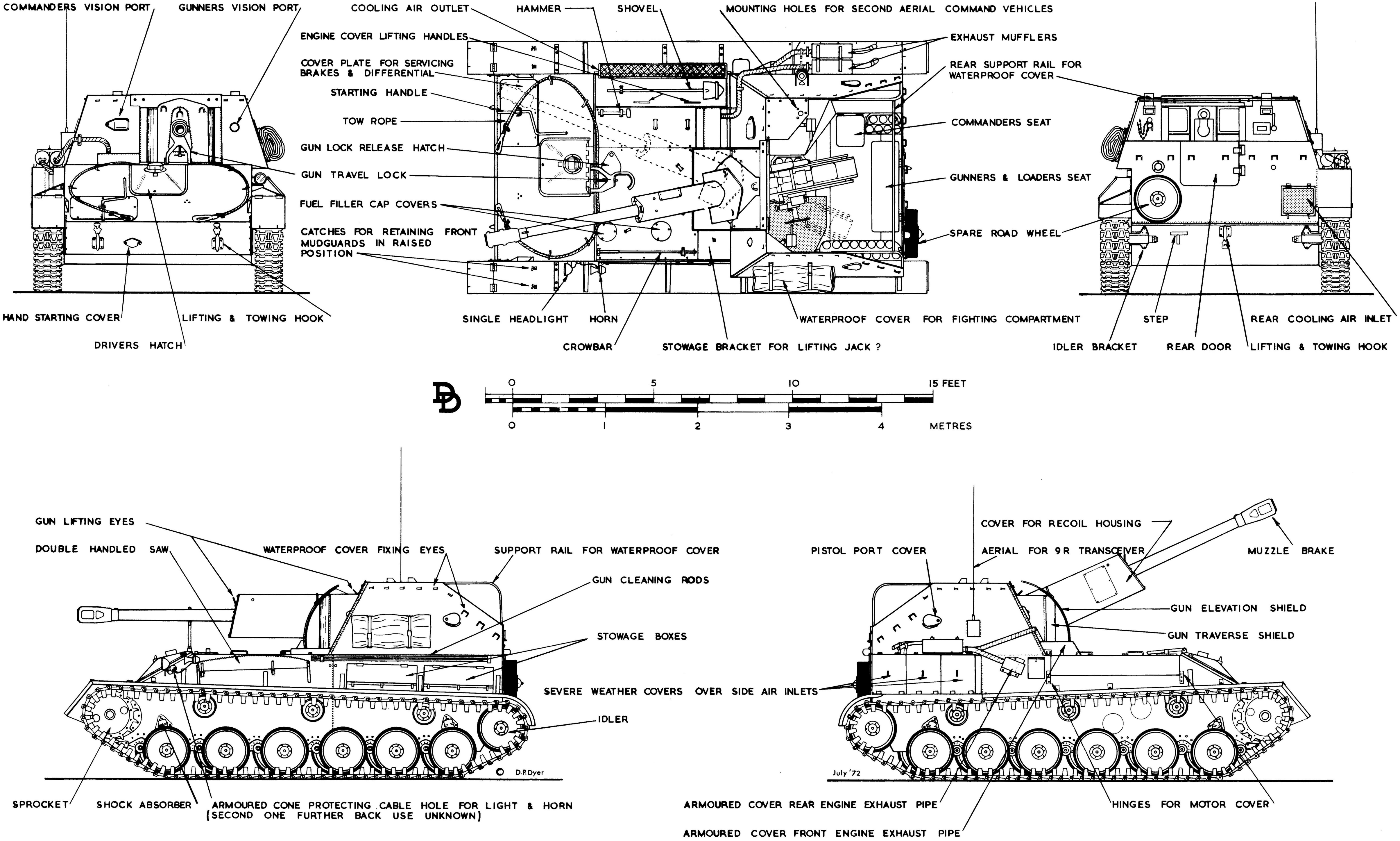
Late Model — Military History Museum, Prague, Czechoslovakia.

Scale 1:25

SU 76

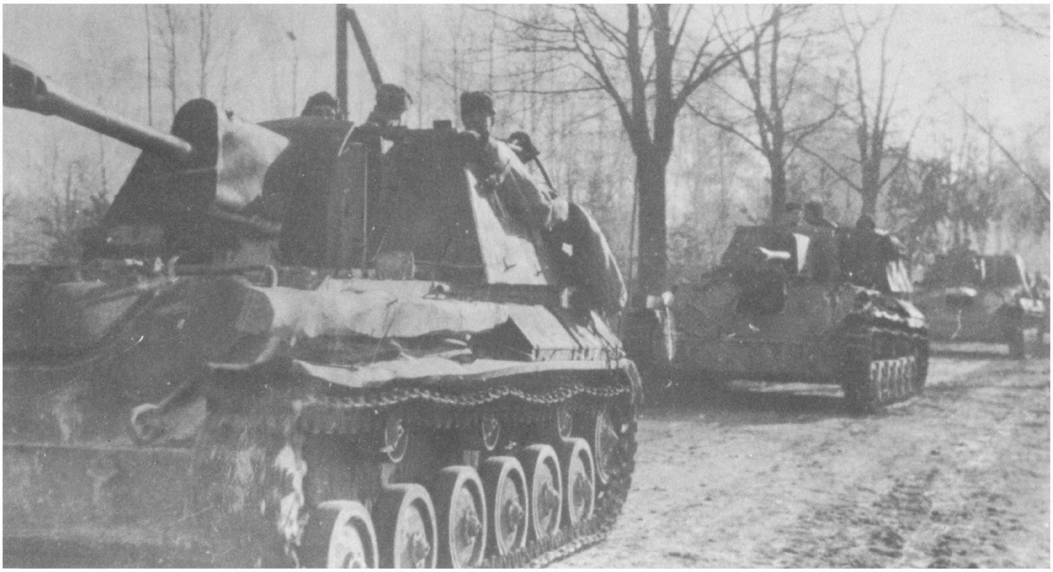
Hull Layout





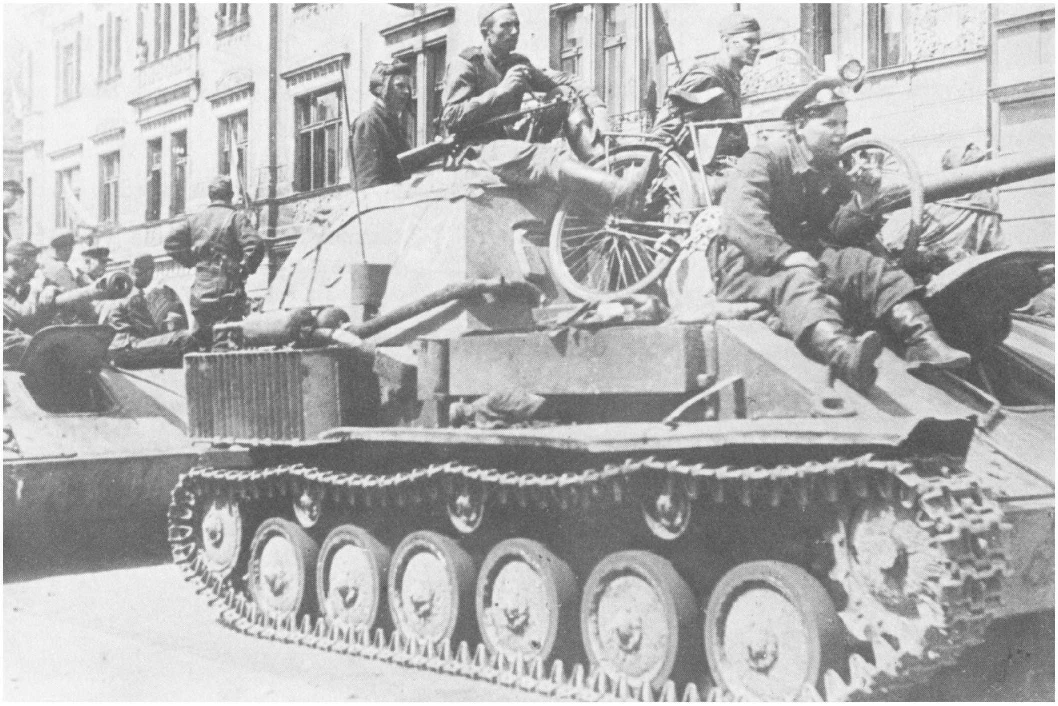
SAMOKHODNAYA USTANOVKA (S.U.) 76

EARLY MODEL

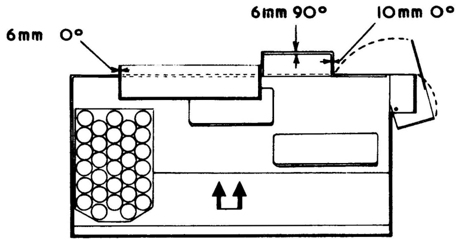


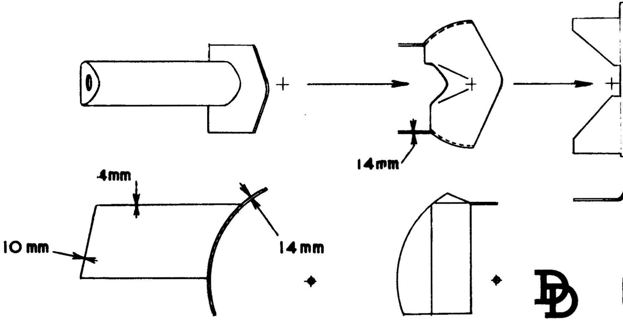
ABOVE: *An interesting action photograph of the typical Wartime model of the SU.76. Note the haphazard stowage of items on these vehicles.*
(ALEXANDR STEFAN PHOTOGRAPH)

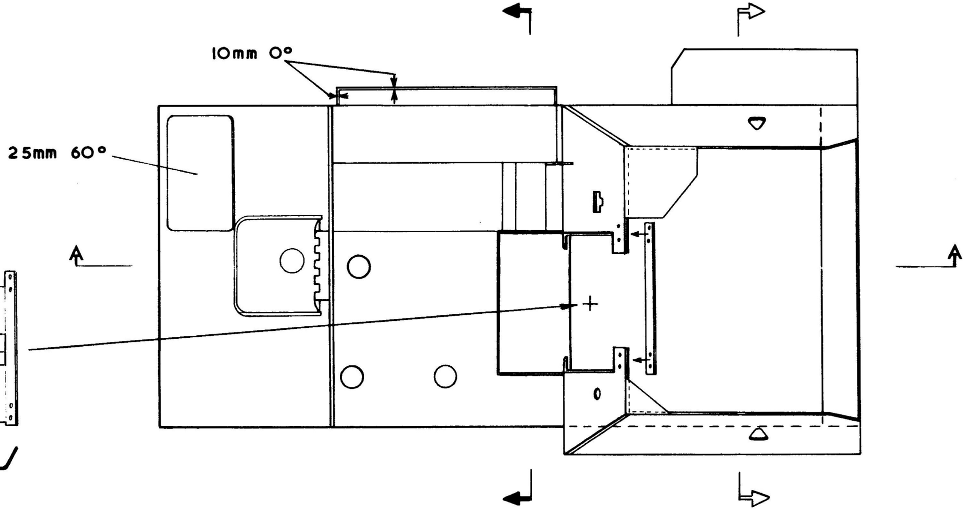
BELOW: *Another action photograph of the SU.76 showing the crew awaiting orders. Note the heavily over-loaded condition of this particular vehicle, the rear wheel is almost in contact with the rear return roller.*
(ALEXANDR STEFAN PHOTOGRAPH)

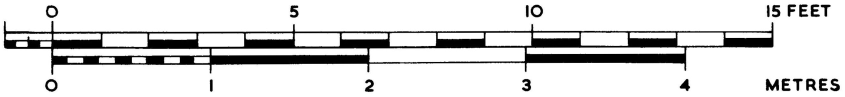


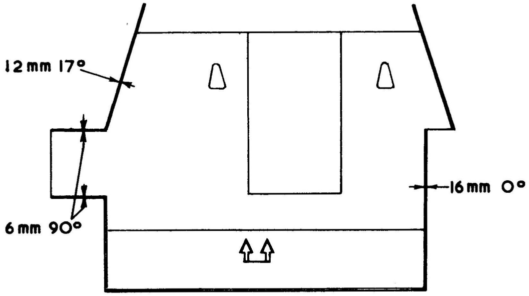
Scale 1:48 **S.U. 76** Armour Protection

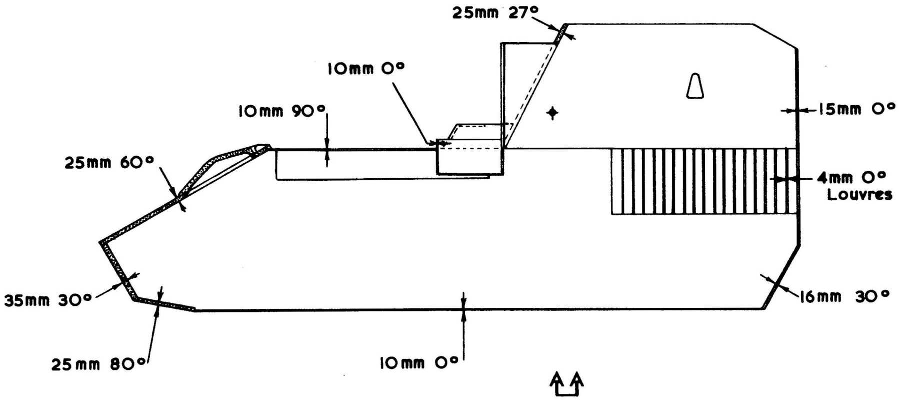




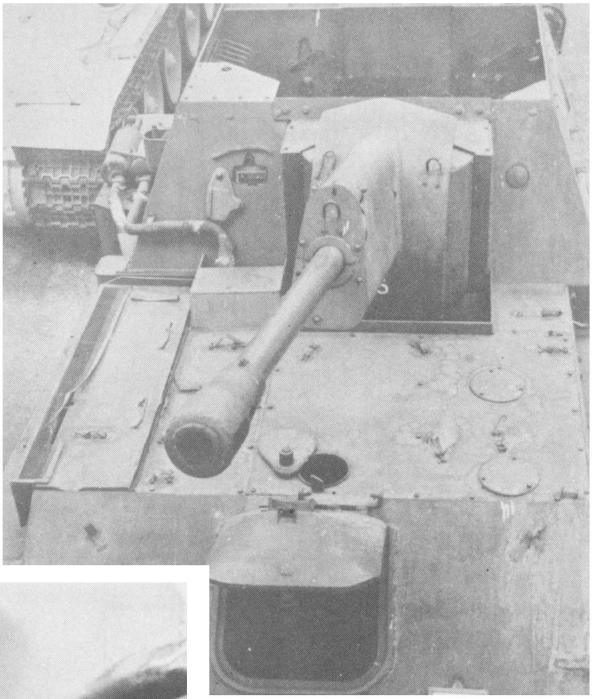


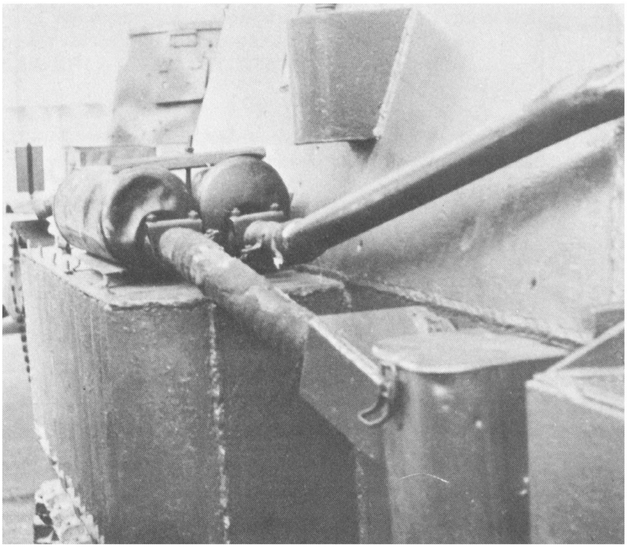




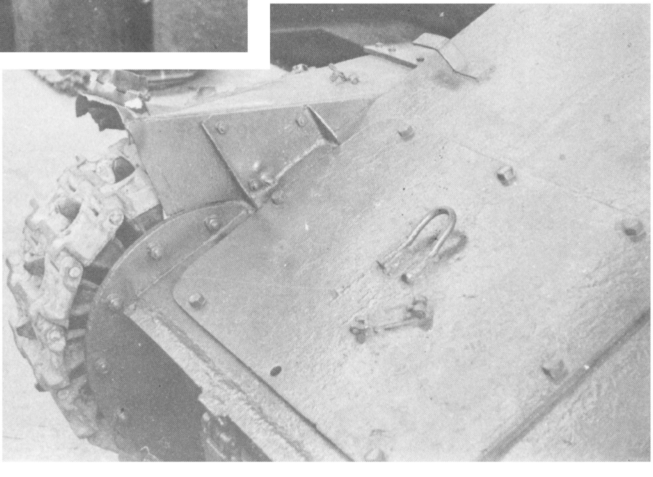


This photograph of the SU.76 exhibited at the R.A.C. Tank Museum in Bovington shows clearly how the gun and fighting compartment are offset to the left side. On the right side can be seen the open commander's vision port, to the front is the open driver's hatch and the roof port which allowed the driver to uncouple the gun travel rest which is missing on this vehicle.

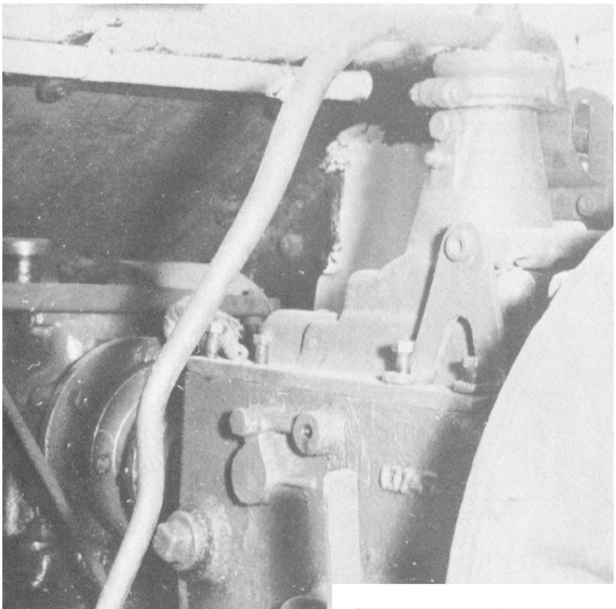




On the right hand side of the SU.76 there were two separate exhaust pipes from the twin engines.

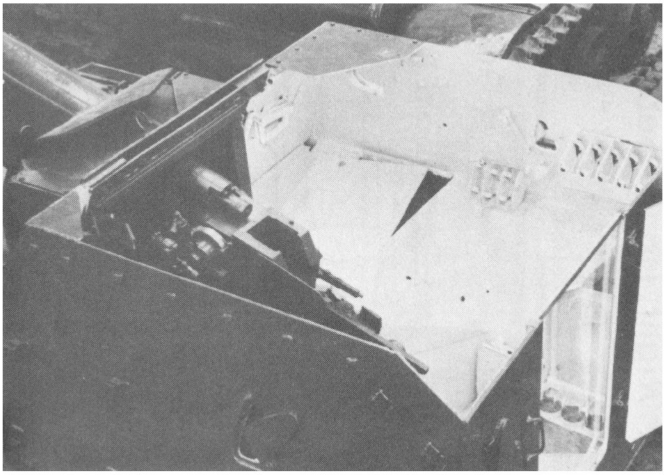


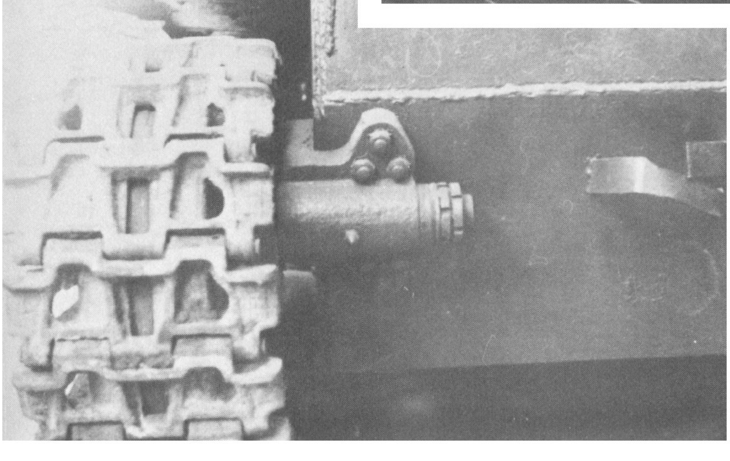
The service plate fitted over the brakes and differential unit. Note the lifting lug which was usually used as a convenient stowage position for the starting handle.



This view, from the driver's seat shows the gearbox leading to the differential in the front of the right hand side of the hull. Of interest is the gear lever which starts on top on the gear-box and comes down to within reach of the driver on the left.

Interior view of the right side of the fighting compartment. Note how the frontal armour was arranged to allow removal of the gun.



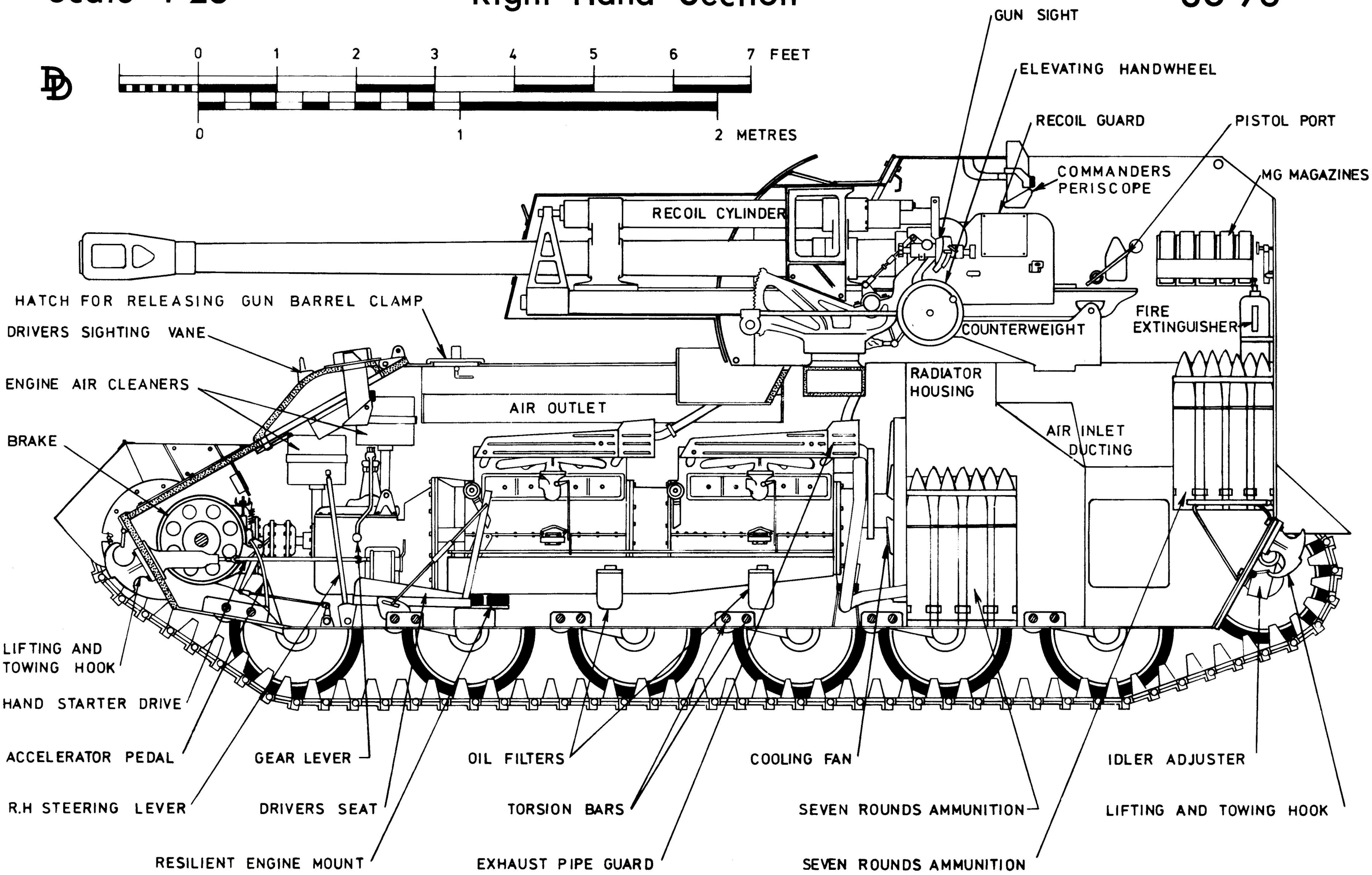


The idler bracket and track link detail from the rear. Also seen is the step which on this exhibit has been broken.

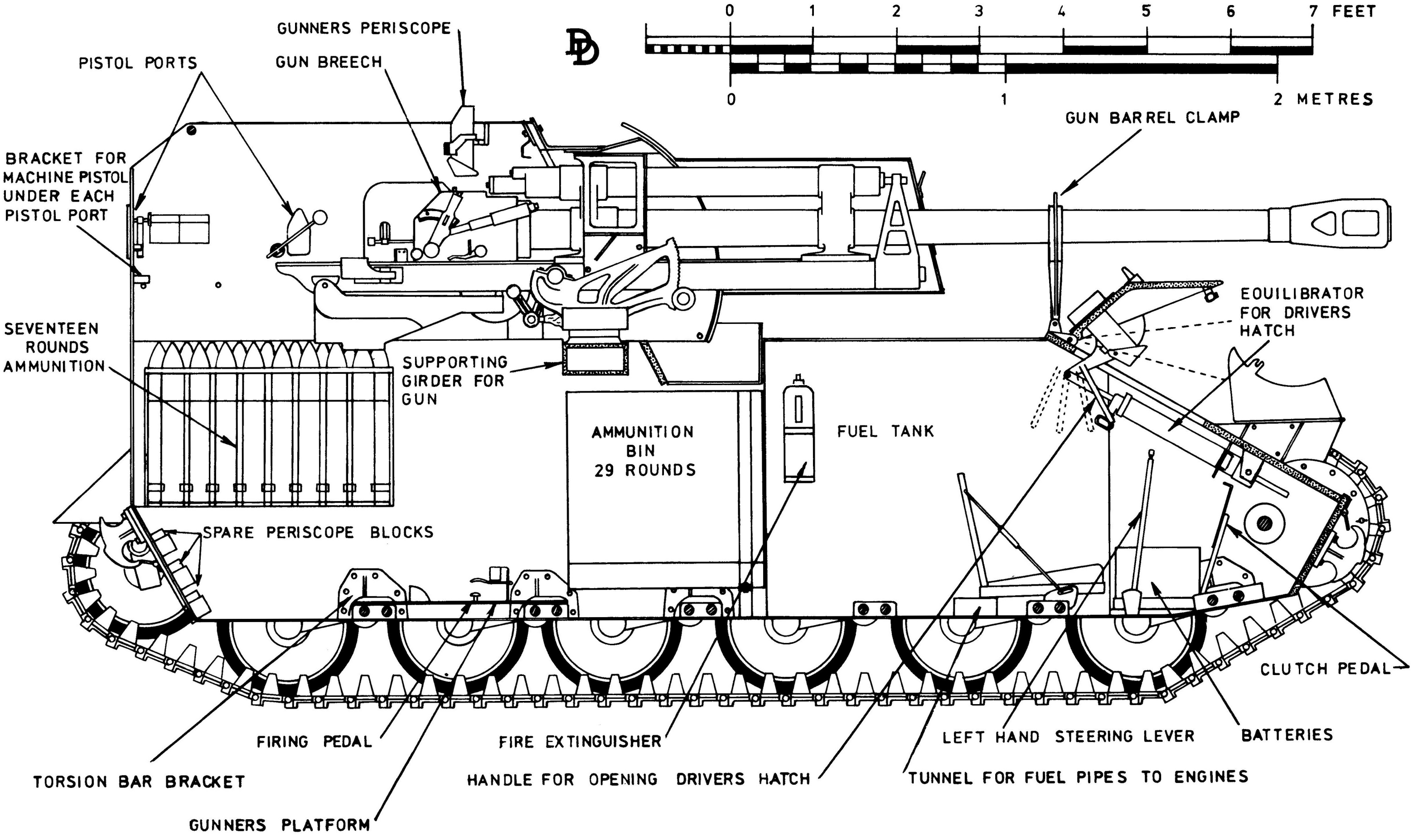
Scale 1:25

Right Hand Section

SU 76



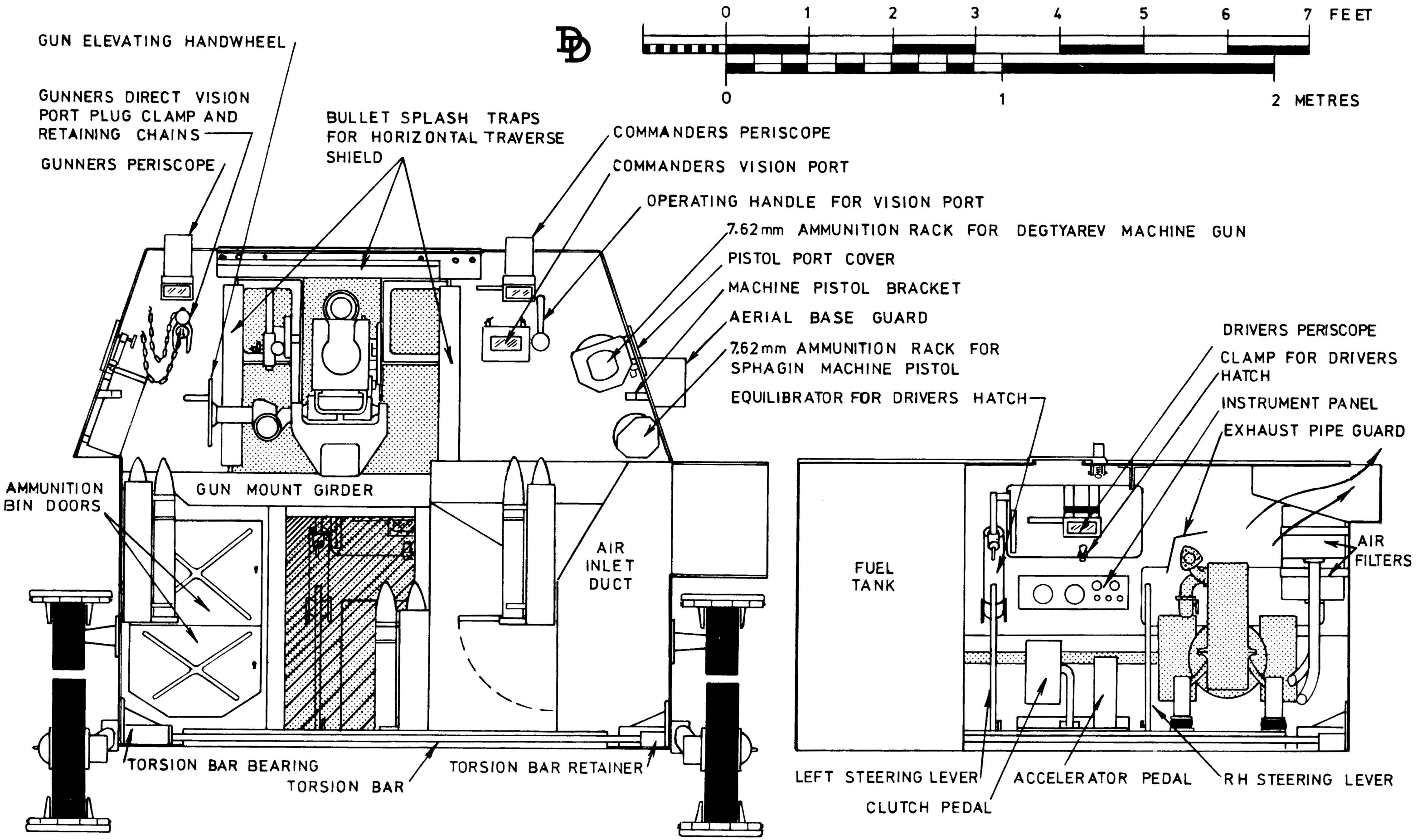
Scale 1:25 **Left Hand Section** **SU 76**



Scale 1:25

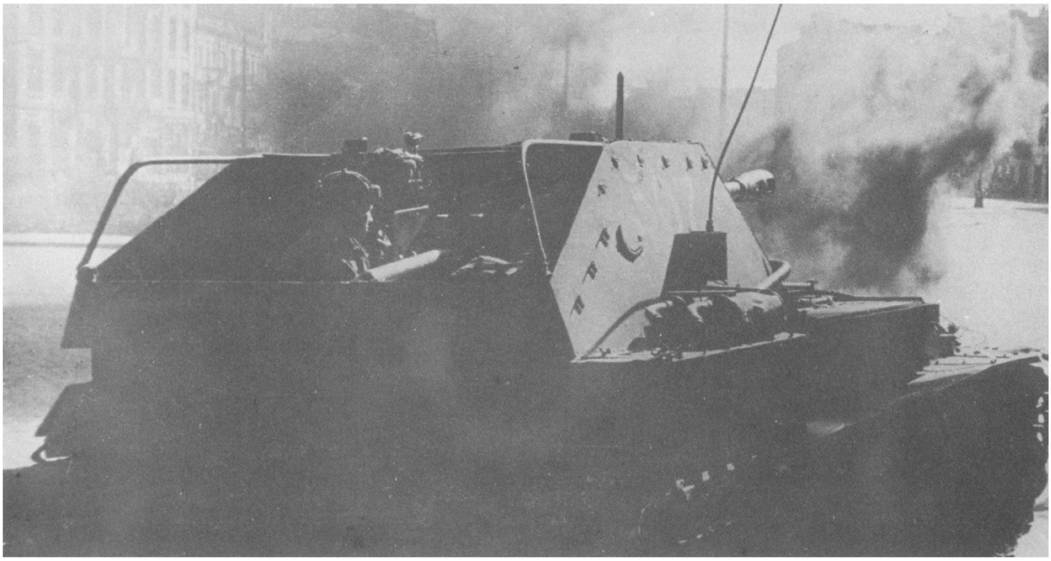
Transverse Sections

SU 76



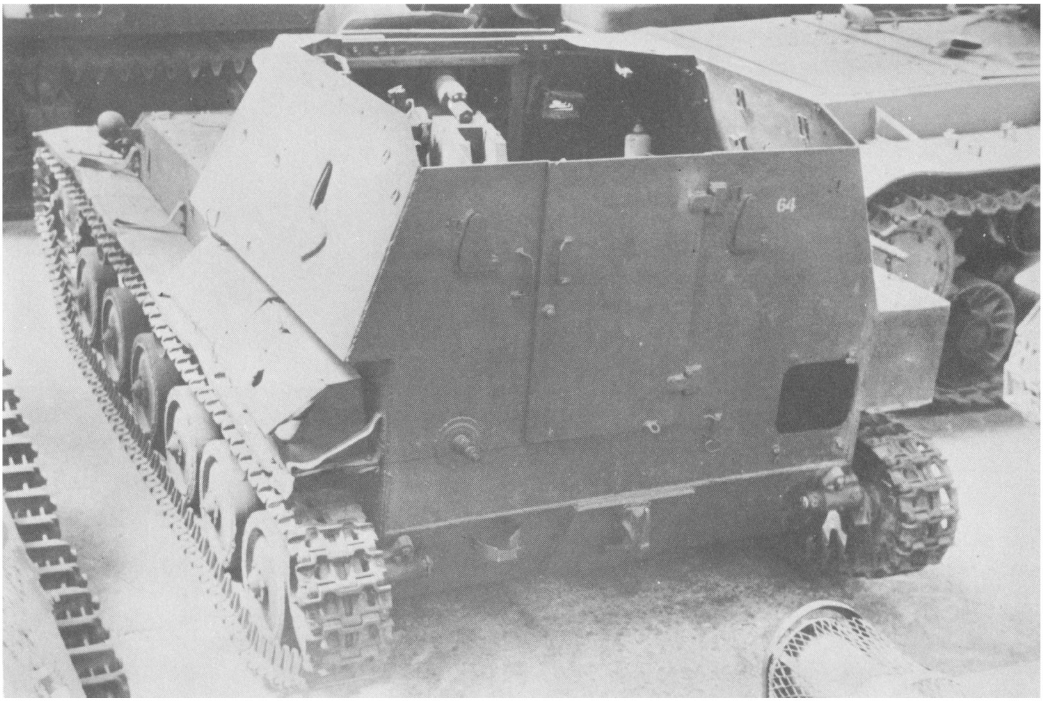
FIGHTING COMPARTMENT LOOKING FORWARD

ENGINE COMPARTMENT LOOKING FORWARD



ABOVE: *An SU.76 firing in the streets of the Praga, a suburb of Warsaw on the East bank of the Vistula, during the battle for Warsaw in mid January 1945.*
(IMPERIAL WAR MUSEUM PHOTGRAPH)

BELOW: *Compare the rear view of this late model of the SU.76, which is on exhibited in the R.A.C. Tank Museum, with the rear of the vehicle shown above. As can be seen the crew of the late model were protected from the rear.*



Technical Specification for Samokhodnaya Ustanovka (SU.76)

Crew:	4 — Driver, Commander, Gunner, Loader
Weight, combat loaded:	24,640 lbs. 11 long tons 12.3 short tons, 10.8 tonnes

Performance

Speed, max. Road:	28 mph (45 Kmph)
Max. Gradient:	25 degrees (47%)
Fording depth:	2'—11" (89 cm)
Trench crossing:	6'—6" (198 cm)
Step:	2'—2" (66 cm)
Ground pressure:	8.1 lbs/sq.ins (.57 Kg/sq.cm)
Range (internal fuel) Road	280 miles (450 Km)
cross country	185 miles (300 Km)
Power to weight ratio:	(Gross) 12.7 HP/ton
Side Slope Ability:	25°

Dimensions

Length overall:	16'—6" (488 cm)
Length:	
Width overall:	8'—11½" (273 cm)
Height:	7'—1½" (217 cm)
Ground clearance:	1'—½" (32 cm)
Fire height of gun:	5'—10½" (179 cm)
Road wheel dia. (overall)	1'—8" (51 cm)

Trackwork

Centres:	7'—10½" (240 cm)
Length on ground:	10'—10" (330 cm)
Width:	11¾" (30 cm)
Pitch:	4½" (11.4 cm)
Number of links per track	89
Type:	Single Dry Pin Outside Guides

Mechanical Details

Engine:	2 x 6 cyl. 70 bhp @ 3600rpm petrol water cooled GAZ 202 or 2 x 6 cyl. 85 bhp @ 3400rpm petrol water cooled GAZ 203 Note vehicles fitted with GAZ 203 Engines were termed SU.76M and had improved speed and less range than figures quoted
Transmission:	Constant 4 forward 1 reverse
Steering:	Clutch and Brake
Suspension:	Torsion Bar

Stowage

Ammunition, main armament:	60 rds.
Internal Fuel capacity:	97 Imp. gals. 116 U.S. gals. 447 Litres

Armour

Type:	Rolled plate welded construction

Communications	9-R Transceiver
Vision	3 Periscopes Driver, Commander, Gunner, Driver direct vision through opened hatch Driver vision port with Bullet proof glass block for commander protected by pivotted armoured cover with vision slit. Direct vision hole for gunner with plug for closure Pistol port both sides of fighting compartment with armoured covers 1 x Pistol Port in LH Rear Door of 'Symmetrical' model 2 x Pistol Ports rear of fighting compartment late model.

Armament

Main:	1 x 76.2mm gun model 42/43
Calibre, and length in calibres:	76.2 mm (3 ins.), L/41.5
Traverse:	20 degrees. Right: 12 degrees left operation hand
Elevation:	plus 25 degrees, minus 3 degrees
Rate of Fire:	15 rounds per minute
Secondary armament:	1 x 7.62mm Degtyarev Machine Gun

Types of Ammunition

	Muzzle Velocity		Penetration 500 metres	Weight of Shell
High Explosive	2230 fps	Range 12,580 yds		
Armour Piercing High explosive	2151 fps	"	2.72" (70 mm) @ 0°	14.3 lb
High velocity armour piercing	3167 fps	"	3.62" (92 mm) @ 0°	13.0 lb
High explosive anti-tank	1065 fps	"	4"/5" (100/127mm) @ 0°	12.6 lb

Published by MODEL & ALLIED PUBLICATIONS LTD. 13-35 Bridge Street, Hemel Hempstead, Herts.

Copyright 1972. Model & Allied Publications Ltd. and D.P. Dyer.

Printed in England by **Technical Print Services Limited,** Brentcliffe Avenue, Carlton Road, Nottingham